

Small Form Factor Bi-Directional Transceiver Module for Gigabit Ethernet



FEATURES

- RoHS compliant
- IEEE802.3ah Gigabit Ethernet compliant
- SFF package with bi-directional SC receptacle
- Upstream 1.25Gbps transmitter with 1310nm FP Laser, and downstream 1.25Gbps receiver with 1490nm PIN-TIA
- Integrated with WDM filter to cut 1550nm and 1650nm optical signal off
- Single +3.3V power supply
- LVTTTL Transmitter Enable input and Rx Signal Detect output
- Laser Class 1 Product which comply with the requirements of IEC 60825-1 and IEC 60825-2

Description

The SFBD-1250xxxx series are 3.3V small Form Factor Bi-Directional Transceiver Module designed expressly for high-speed communication applications that require rates of up to 1.25Gbit/sec. It is compliant with the Gigabit Ethernet standards, as well as the SFF Multisource Agreement (MSA).

The module consists 1310nm FP laser, InGaAs PIN, Preamplifier and WDM filter in a high-integrated optical sub-assembly, and it is contained in a standard SFF package with a 9/125um SC receptacle connector.

Application

- IEEE 802.3ah 1000BASE-BX10-U
- GE-Media Converter
- Gigabit Ethernet P2P Optical Network
- FTTx WDM Broadband Access
- SFBD-1250A4Q1R data link up to 10km in 9/125um single mode fiber.

1. Absolute Maximum Ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|----------------------------|-------------------|------|------|----------------------|------|------|
| Storage Temperature | T _s | -40 | | 85 | °C | |
| Storage Ambient Humidity | HA | 5 | | 95 | % | |
| Power Supply Voltage | V _{CC} | -0.3 | | 4 | V | |
| Signal Input Voltage | | -0.3 | | V _{CC} +0.3 | V | |
| Receiver Damage Threshold | | +3 | | | dBm | |
| Lead Soldering Temperature | T _{SOLD} | | | 260 | °C | |
| Lead Soldering Time | t _{SOLD} | | | 10 | sec | |

2. Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------------|-----------------|-----------------|------|-----------------|-------|------------------|
| Ambient Operating Temperature | T _A | 0 | | 70 | °C | Without air flow |
| Ambient Humidity | HA | 5 | | 85 | % | Non-condensing |
| Power Supply Voltage | V _{CC} | 3.13 | 3.3 | 3.47 | V | |
| Power Supply Current | I _{CC} | | | 300 | mA | |
| Power Supply Noise Rejection | | | | 100 | mVp-p | 100Hz to 1MHz |
| Data Rate | | 1.25 -100ppm | 1.25 | 1.25 +100ppm | Gbps | |
| Transmission Distance | | | | 10 | km | |

3. Specification of Transmitter

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------------------|--|-----------------------------|------|------|-------|----------|
| Average Launched Power | P _O | -9 | | -3 | dBm | Note (1) |
| Launched power (Peak.) | P _P | | | 0 | dBm | |
| Extinction Ratio | ER | 9 | | | dB | |
| Center Wavelength | λ _c | 1260 | 1310 | 1360 | nm | FP Laser |
| Spectrum Width (RMS) | σ | Compliant with IEEE 802.3ah | | | nm | Note (4) |
| Transmitter OFF Output Power | P _{Off} | | | -45 | dBm | |
| Optical Rise/Fall Time | t _r /t _f | | | 260 | ps | Note (2) |
| Total Jitter | t _J | | | 227 | ps | Note (3) |
| Optical Return Loss Tolerance | ORLT | | | 12 | dB | |
| Relative Intensity Noise | RIN ₁₂ OMA | | | -113 | dB/Hz | |
| Optical Transmitter Reflectance | | | | -6 | dB | |
| Transmitter and Dispersion Penalty | TDP | | | 3.3 | dB | |
| Output Eye Mask {X1,X2,Y1,Y2,Y3} | Compliant with IEEE 802.3ah {0.22,0.375,0.20,0.20,0.30} | | | | | Note (5) |

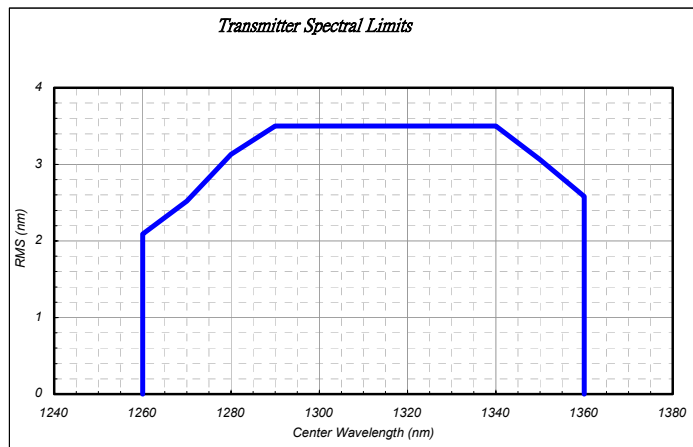
Note (1). Launched power (avg.) is power coupled into a single mode fiber with master connector.

Note (2). These are unfiltered 20-80% values.

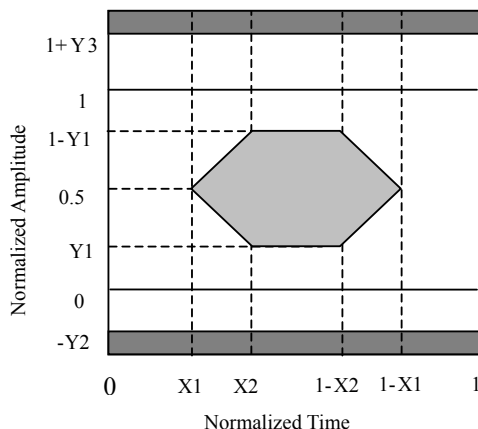
Note (3). Measure at 2⁷-1 NRZ PRBS pattern

Note (4): Spectral Width (RMS)

| Center Wavelength | RMS spectral width(max) |
|-------------------|-------------------------|
| nm | nm |
| 1260 | 2.09 |
| 1270 | 2.52 |
| 1280 | 3.13 |
| 1290 | 3.50 |
| 1295 | |
| 1297 | |
| 1329 | |
| 1331 | |
| 1340 | |
| 1350 | 3.06 |
| 1360 | 2.58 |



Note (5). Transmitter eye mask definition



4. Specification of Receiver

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|----------------|------|------|------|------|----------|
| Input Optical Wavelength | λ_{IN} | 1480 | 1490 | 1500 | nm | PIN-PD |
| Receiver Sensitivity | P_{IN} | | | -23 | dBm | Note (1) |
| Input Saturation Power (Overload) | P_{SAT} | -3 | | | dBm | |
| Signal Detect -Assert Power | P_A | | | -24 | dBm | |
| Signal Detect -Deassert Power | P_D | -44 | | | dBm | Note (2) |
| Signal Detect Hysteresis | $P_A - P_D$ | 0.5 | 2 | 5 | dB | |
| Data Output Rise/Fall time | t_r/t_f | | | 260 | ps | Note (3) |
| Optical Receiver Reflectance | | | | -12 | dB | Note (4) |
| Optical Isolation from External Source | 1260 to 1360nm | | | -43 | dB | |
| | 1550 to 1560nm | | | -33 | dB | |
| | 1640 to 1665nm | | | -33 | dB | |

Note (1). Measured with Light source 1490nm, ER=9dB; BER = $<10^{-12}$ @ PRBS=2⁷-1 NRZ

Note (2). When SD deasserted, the data output is Low-level (fixed)

Note (3). These are 20%~80% values.

Note (4). Measured at wavelength of 1490nm.

5. Electrical Interface Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------------------------|-------------------|------|------|----------------------|-------------------|----------|
| Transmitter | | | | | | |
| Total Supply Current | I _{CC} | | | A | mA | Note (1) |
| Differential line input Impedance | R _{IN} | 90 | 100 | 110 | Ohm | |
| Differential Data Input Swing | V _{DT} | 400 | | 1600 | mV _{p-p} | Note (2) |
| Transmitter Disable Input-High | V _{DISH} | 2 | | V _{CC} | V | LVTTTL |
| Transmitter Disable Input-Low | V _{DISL} | 0 | | 0.8 | V | |
| Receiver | | | | | | |
| Total Supply Current | I _{CC} | | | B | mA | Note (1) |
| Differential Data Output Swing | V _{DR} | 400 | 800 | 1200 | mV _{p-p} | Note (2) |
| Signal Detect Output Voltage-High | V _{LOSH} | 2 | | V _{CC} +0.3 | V | Note (3) |
| Signal Detect Output Voltage-Low | V _{LOSL} | 0 | | 0.8 | V | |

Note (1). A (TX)+ B (RX) = 300mA (Not include termination circuit)

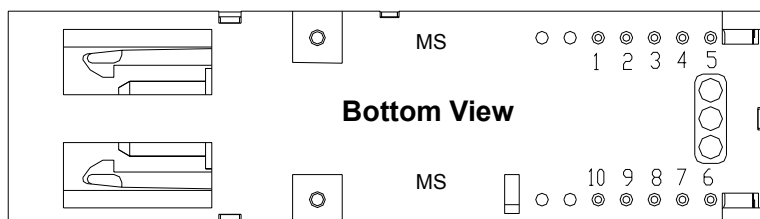
Note (2). Internally AC coupled, but requires a 100Ohm differential termination at or internal to Serializer/Deserializer.

Note (3). LVTTTL logic output, internal 4.7K~10K Ohm pull-up resistor. External load on host board is unnecessary.

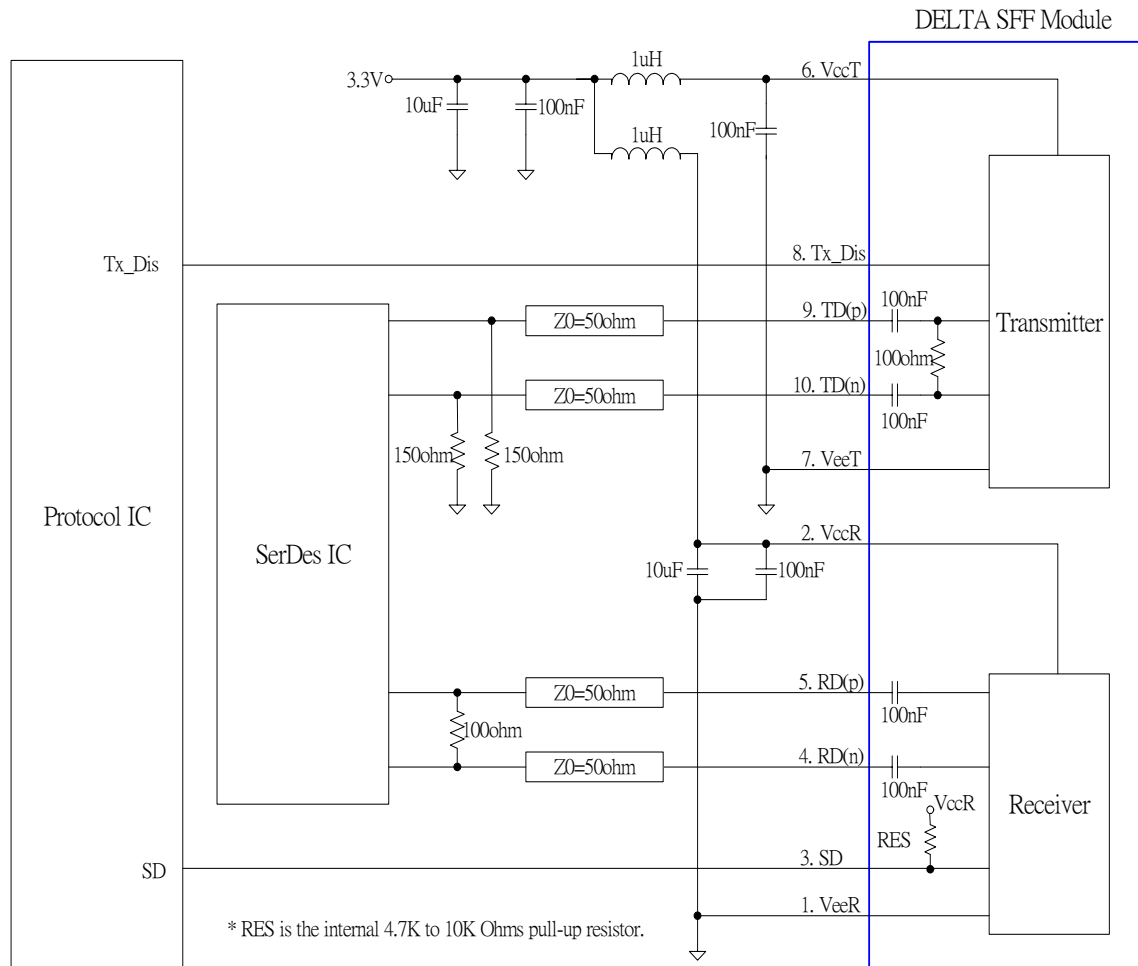
6. Pin Description

| Tx/Rx | Pin No. | I/O | Pin Name | Description |
|-------|---------|-----|----------|---|
| Rx | 1 | | VeeR | Receiver Ground |
| | 2 | | VccR | +3.3V Receiver Power Supply |
| | 3 | O | SD | Normal Optical Input indicated by logic "High", and No Optical Input indicated by logic "Low". (LVTTTL) |
| | 4 | O | RD(n) | Inverted Receiver Data Output (AC-Coupled CML output) |
| | 5 | O | RD(p) | Non-Inverted Receiver Data Output (AC-Coupled CML output) |
| Tx | 6 | | VccT | +3.3V Transmitter Power Supply |
| | 7 | | VeeT | Transmitter Ground |
| | 8 | I | Tx_Dis | LVTTTL Logic "High" to Disable Transmitter, and Enable Transmitter by Logic "Low". |
| | 9 | I | TD(p) | Non-Inverted Transmitter Data Input (AC-Coupled LVPECL input) |
| | 10 | I | TD(n) | Inverted Transmitter Data Input (AC-Coupled LVPECL input) |
| | | | MS | Mounting studs/ connect this pin to Chassis ground |

Note (1). EMI shielding lead must be connected to Signal ground

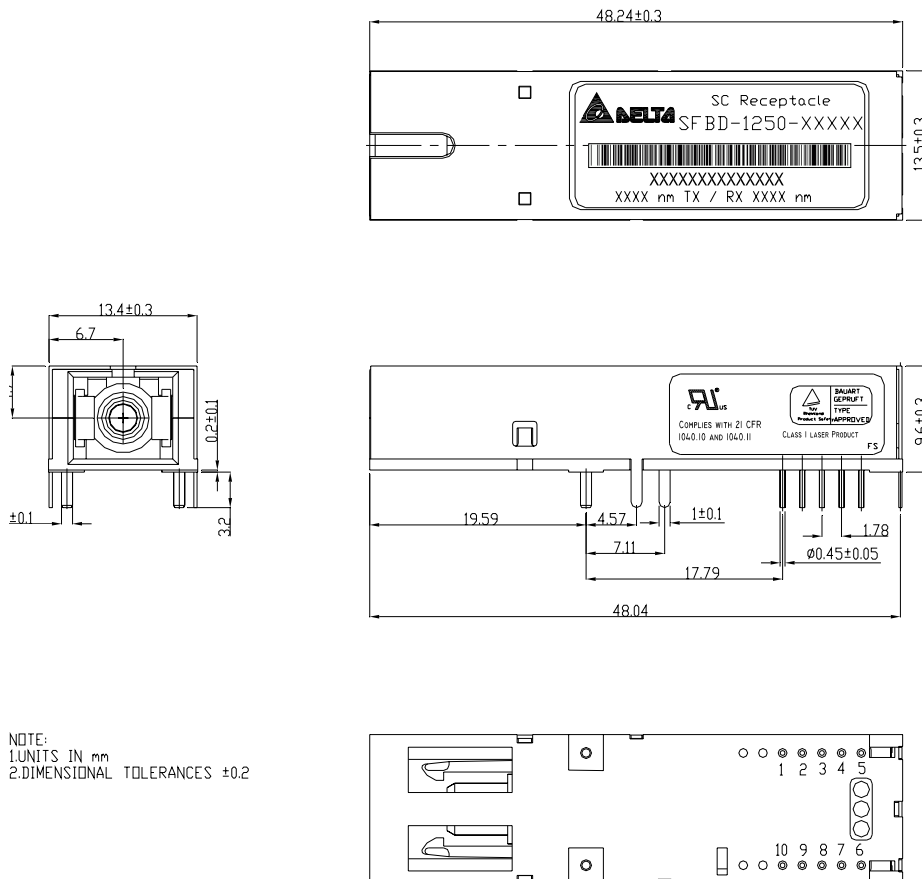


7. Recommended Interface Circuit (AC Coupling)



8. Outline Dimensions

| Parameter | Unit | Description | Note |
|-----------------------|------|------------------|-------------|
| Mechanical Dimensions | mm | 48.3x13.5x9.6 | |
| Connector Type | - | SC/UPC connector | IEC-61754-4 |



S/ N

14 digits
 XX XX XX XX X XXXXX
 DE 05 01 00 R 00001

S/N : (00001~99999)
 Rework : Rework=R or No-rework=0
 Vender NOTE : Free or 00
 Week (52Weeks/Year) : 1月2日=01
 Year : 2005=05
 Vender CODE : DELTA=DE

9. Regulatory Compliance

| Feature | Test Method | Reference | Performance |
|---|------------------------|---|--|
| Electrostatic Discharge (ESD) to the Electrical Pins | Human Body Model (HBM) | MIL-STD-883E Method 3015.7 EIA-JESD22-A114 | (1) Satisfied with electrical characteristics of product spec. |
| | Machine Model (MM) | EIA-JESD22-A115 | |
| Electrostatic Discharge (ESD) to the Simplex Receptacle | Contact Discharge | IEC/EN 61000-4-2 | (2) No physical damage |
| | Air Discharge | IEC/EN 61000-4-2 | |
| Radio Frequency Electromagnetic Field Immunity | | IEC/EN 61000-4-3 | |
| Electromagnetic Interference (EMI) | | FCC Part 15 Class B EN 55022 Class B (CISPR 22A) | |
| Laser Eye Safety | FDA/CDRH | FDA 21CFR 1040.10, 1040.11 | CDRH File # 0420993 |
| | TUV | IEC/EN 60825-1 IEC/EN 60825-2 | TUV Certificate # R50032471 |
| Component Recognition | TUV | IEC/EN 60950 | |
| | UL/CSA | UL 60950 | UL File # E239394 |

Appendix A. Document Revision

| Version No. | Date | Description |
|-------------|------------|-----------------------|
| S0 | 2007-04-12 | Preliminary datasheet |
| | | |